Fundamental Studies of Mechanical and Tribological Properties of Ultrananocrystalline Diamond (UNCD) Thin Films and Applications to MEMS

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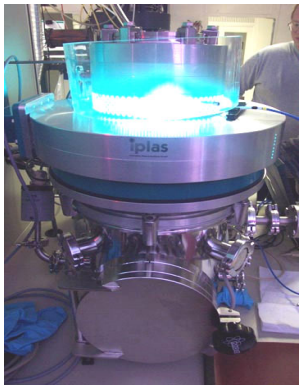
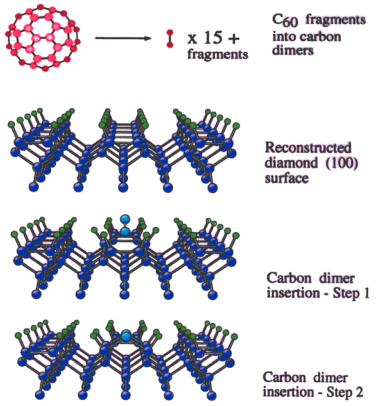
Motivation/Major accomplishments

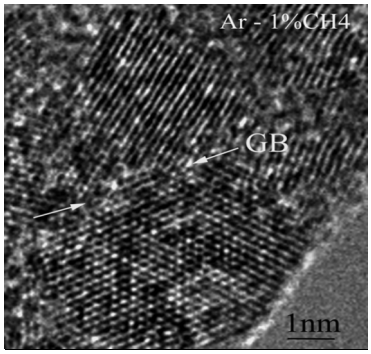
Studies of mechanical properties of UNCD films at the MEMS scale via fabrication of bridge and cantilevers structures. Use new microwave plasma CVD system assembled in MSD to produce UNCD films for fabrication of MEMS structures.



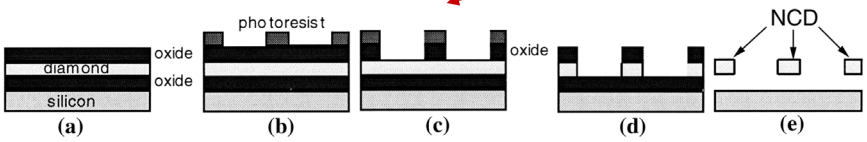
MPCVD system



UNCD growth mechanism: Insertion of C_2 into surface of growing film

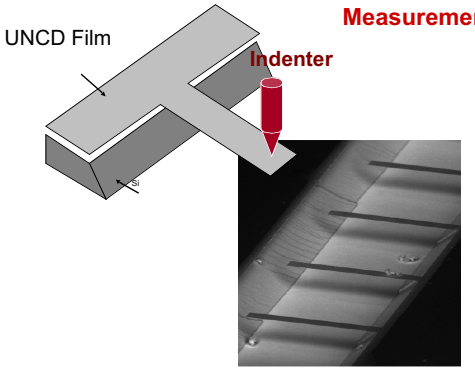


HRTEM of UNCD

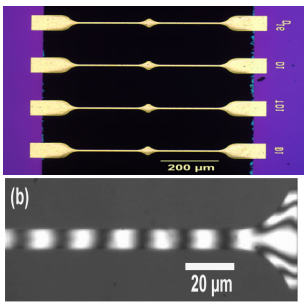


Schematic of fabrication process for MEMS structures

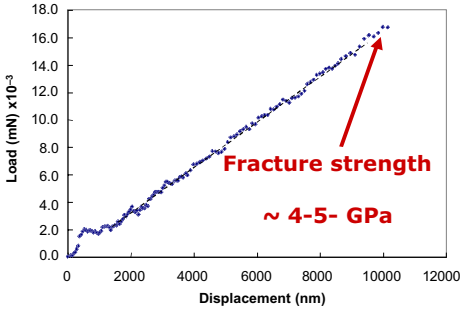
Measurement of mechanical properties of UNCD films at MEMS scale



Schematic of cantilever method & SEM picture of UNCD cantilevers produced for measurements



UNCD membranes & optical picture of deformed membrane that yields strain and fracture strength



Load vs displacement curve yields strain & fracture strength

FUTURE WORK

- Further measurements of mechanical properties at MEMS scale

BES - DOE

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MSD - ANL